Claims

[c1] 1.A spin coating process, comprising:

dispensing a solution of a solution solvent and about 3 to about 30 wt% thermoplastic polymer, based upon the total weight of the solution, wherein the solution solvent has a boiling point at atmospheric pressure of about 110 ° C to about 250 ° C, a polarity index of greater than or equal to about 4.0, a pH of about 5.5 to about 9;

spinning the substrate; and

removing the solution solvent to produce a coated substrate comprising a coating having less than or equal to 10 asperities over the entire surface of the coated substrate.

[c2] 2.The process of Claim 2, where the thermoplastic polymer has a weight average molecular weight of 20,000 to 70,000 Daltons.

[c3] 3.The process of Claim 1, where the thermoplastic polymer has a Tg about 200 to about 260 ° C.

[c4] 4.The process of Claim 1, where the thermoplastic polymer has less than or equal to about 20 meq/Kg of functional groups selected from the group consisting of: carboxylic acids, carboxylic acid salts, carboxylic anhydrides, amines, phenols, alcohols, nitriles, epoxides, oxetanes, isocyanates, cyanurates, oxazoles, cyclobutyl, alkenes, alkynes, and combinations comprising at least one of the foregoing groups.

[c5] 5.The process of Claim 4, where the functional groups comprise carboxylic acid groups.

[c6] 6.The process of Claim 1, where the thermoplastic polymer has a weight average molecular weight, measured determined by GPC using methylene chloride as a GPC solvent, changes by less than or equal to about 10% during the entire process.

[c7] 7.The process of Claim 1, where the thermoplastic polymer is a resin selected from the group consisting of polyimides, polyetherimides, polysulfones, polyethersulfones, polycarbonates, polyester carbonates, polyphenylene ethers,

polyarylates, and combinations comprising at least one of the foregoing resins.

[c8] 8.The process of Claim 1 where the solvent is selected from the group consisting of aryl acetates and C_4 - C_{10} alkyl acetates, C_2 -C_6 alkyl carbonates, formamides, C_1 -C6 N-alkyl formamides, C_1 -C_6 alkyl sulfoxides, alkoxy alkyl acetates, C_1 -C_6 N-alkyl pyrrolidones, phenols, C_1 -C_6 alkyl phenols, aryl ethers, C_1 -C_6 alky aryl ethers, C_1 -C_6 alkyl ureas, C_4 -C_6 sulfolanes, N-acetyl cyclic ethers, C_1 -C_6 alky acetamides, C_1 -C_6 alkyl phosphoramides, C_3 -C_6 lactones, aryl alkyl ketones, and miscible combinations comprising at least one of the foregoing solvents.

[c9] 9.The process of Claim 8, where the solvent is selected from the group consisting of butyl acetate, diethyl carbonate, formamide, methyl formamide, dimethyl formamide, dimethyl sulfoxide, methoxy ethyl acetate, N-methyl pyrrolidone, propylene carbonate, anisole, tetra methyl urea, dimethyl urea, sulfolane, methyl anisole, N-acetyl morpholane, dimethyl acetamide, mono methyl acetamide, veratole, hexamethyl phosphoramide, buytrolactone, acetophenone, phenol, cresol, mesitol, xylenol, and miscible combinations comprising at least one of the foregoing solvents.

[c10] 10.The process of Claim 1, wherein the solvent comprises less than or equal to about 1 wt% halogens, based upon the total weight of the solvent.

[c11] 11.The process of Claim 1, wherein the solvent has a dielectric constant of greater than or equal to about 10.

[c12] 12.The process of Claim 1, wherein the solution has a viscosity, as measured by ASTM D1824 at room temperature, of about 1 to about 2,000 Cps.

[c13] 13.The process of Claim 12, wherein the viscosity changes less than or equal to about 25% after heating at 45 ° C for 3 hrs.

[c14] 14.The process of Claim 1, wherein the solution comprises less than or equal to about 0.1 wt% particles having a diameter, measured along a major axis or greater than or equal to about 0.05 micrometers, as determined by laser light scattering.

[c15] 15.The process of Claim 1, wherein the coating comprises a percent haze, as measured by ASTM D1003, of less than or equal to about 1%.

[c16] 16.The process of Claim 1, where the solution has a water content of less than or equal to about 0.5 wt%, based upon the total weight of the solution.

[c17] 17.The process of Claim 1, wherein the coated substrate has a peel strength of greater than or equal to about 1 lb/in.

[c18] 18.A spin coating process, comprising:
dispensing a solution onto a substrate, the solution comprising a plastic and a first solvent having a boiling point of about 125 ° C to about 180 ° C and a second solvent having a boiling point of about 190 ° C or greater; and
spinning the substrate to coat the substrate with the solution.

[c19] 19.The process of Claim 18, further comprising dispensing the solution while moving a dispenser over the substrate via a spiral translation.

[c20] 20.The process of Claim 18, further comprising dispensing the solution while moving a dispenser over the substrate via an arc translation.

[c21] 21.The process of Claim 18, wherein the coating has a roughness of less than or equal to about 5 Å .

[c22] 22.The process of Claim 18, wherein the coating has a waviness, as measured by a peak to valley deviation over an about 4 mm^2 area, of about 15 nm or less, has less than or equal to about 3 asperities over the entire surface of the substrate, with an asperity height of less than or equal to about 25 nm.

[c23] 23.The process of Claim 22, wherein the coating has less than or equal to about 1 asperity over the entire surface of the substrate.

[c24] 24.The process of Claim 22, wherein the asperity height is less than or equal to about 15 nm.

[c25] 25.The process of Claim 18, wherein the first solvent has a boiling point of about 125 ° C to about 155 ° C.

[c26] 26.The process of Claim 18, wherein the solution comprises about 5 wt% to about 50 wt% of the first solvent, based upon the total weight of the solvent.

[c27] 27.The process of Claim 26, wherein the solution comprises about 25 wt% to about 45 wt% of the first solvent, based upon the total weight of the solvent.

[c28] 28.The process of Claim 18, wherein the first solvent is selected from the group consisting of anisole, dichlorobenzene, xylene, and combinations comprising at least one of the foregoing first solvents.

[c29] 29.The process of Claim 18, wherein the second solvent is selected from the group consisting of cresol, gamma-butyrolactone, acetophenone, N-methyl-pyrrolidone, and combinations comprising at least one of the foregoing second solvents.

[c30] 30.A spin coating process, comprising:

spinning a substrate;

dispensing a solution onto the substrate at a first speed while moving a dispenser over the substrate via an arc translation; and

spinning the substrate at a second speed to coat the substrate with the solution;

wherein the first speed is slower than the second speed.

[c31] 31.The process of Claim 30, wherein the coating has a roughness of less than or equal to about 5 Å .

[c32] 32.The process of Claim 30, wherein the coating has a waviness, as measured by a peak to valley deviation over an about 4 mm^2 area, of less than or equal to about 15 nm.

[c33] 33.The process of Claim 30, wherein the coating has less than or equal to about 1 asperity over the entire surface of the substrate.

[c34] 34.The process of Claim 33, wherein the coating has an asperity height of less than or equal to about 15 nm.

[c35] 35.A spin coated substrate formed by the process of Claim 30.

[c36] 36.A spin coated substrate formed by the process of Claim 1.